VIRGINIA GIS REFERENCE BOOK

General Application Category/Sub Application Name: Park Authority

Product /Service/Function Name: Asset inventory

P/S/F/ Description: An application to allow park administrations to manage the parkland and the assets in each park. Each park property is represented by a boundary polygon and has associated attribute information such as ownership deeds or lease contracts, acreage, facilities, trails, maintenance schedules, and reservation schedules. Digital data for the park polygons may be available from local municipal governments or may be created from plats or surveys available in the county or local deed room. Attribute information associated with each park may be created from park administration records.

Product /Service/Function

1. Spatial Data:

Spatial Data is information about the location and shape of, and relationships among geographic features, usually stored as coordinates and topology. In general terms, spatial data is a term given to digital information that contains a geographic component.

The most basic format of spatial data is typically in the form of "shape" file (ESRI file format), or a DWG file (AutoCAD file format). These file formats are, for the most part, standards in the GIS industry. This spatial data can be presented within certain software packages in varying degrees of formatting, such as coverages, themes and projects. Spatial data is usually categorized in two ways. Vector spatial data are typically point, line, polyline, or polygon shapes depicting objects or features. Raster spatial data are typically imagery-based data such as orthophotography or image based generated such as digital raster graphics. Raster imagery is typically used as a base layer or frame of reference layer.

- Minimum Requirements: At a minimum, a functioning application that provides a basic level of asset inventory must have spatial data representing the boundaries of each park and existing facilities within a park, such as road lines, building, parking lot, and other facilities points such as maintenance buildings and picnic shelters. Additionally, a base spatial data layer will be needed to provide a frame of reference for the desired region. If the above spatial layers are not already compiled then they will need to created or developed using standard GIS data collection and development processes. It may be preferable to develop all spatial data in the same coordinate system, projection and file formats.

- Optional Requirements: Additional spatial data layers will enhance the overall usefulness of the GIS. Optional spatial data are environmental data layers such as hypsography, hydrology, environmental boundaries, and special habitat boundaries. Other vector data are electric, water, sewer access points and lines. Building footprint polygons could be generated instead of points. Multiple base map layers such as digital raster graphics (DRGs) from the USGS or digital elevation model graphics (DEMs) may be added as base map layers in order to convey additional information to the user. Park 'zone' polygons may be developed to show boundaries between areas that are used for different purposes in the park.

2.Attribute Data

Attribute data are characteristics of a geographic features described by numbers, characters, images or drawings, typically stored in a tabular format and linked to the feature by a user-assigned identifier. In most basic terms attribute data are tabular data in a database structure that link to and hold additional information about corresponding spatial data.

Attribute data will generally be in two forms. One form will be tabular data in a ".dbf" file format which is a component of the ESRI shape file set. These spatial data are typically and best limited to unique identifier column and columns that hold pertinent spatial information such as lat/long information or X/Y positions. Additional attribute information should be housed in a separate typical database structure (ASCII text file, spreadsheet, database) that links to the unique identifier of the records in the shape file "dbf". These data can contain all additional information that is needed or desired to convey information about a particular spatial element. All data structures and naming conventions should be in standard ANSI formats.

- Minimum Requirements: At a minimum, typical attribute data for asset inventory are the dimensions of the park properties such as acreage, name, length and maintenance schedule of trails, painting schedule of buildings, parking capacity and the reservation schedule of shelters. Additionally, all critical features considered assets may be tracked to include: item number or name, condition, manufacturer, install date, value, last service date, and other information deemed important to the park authority.

- Optional Requirements: Optional attribute information to be collected for park properties includes easements, address/location, zoning, lease or ownership agreements, and contact information.

3. Data Acquisition Options (integrated with VBMP digital orthos):

Data acquisition will basically be divided into two categories for an organization. The first is to collect and develop data "in-house." Another category is acquiring data that have already been developed. Where possible, acquiring data that have already been developed will be the desired model. Spatial data collection will need to done with the use of field personnel and GPS equipment or possibly a survey team. Spatial data acquisition should be conducted by utilizing the wealth of spatial data resources currently available at various local, state and national levels. This includes, but is not limited to, the Virginia Geographic Information Network (VGIN), The Virginia Economic Development Partnership (VEDP), and the USGS. Tabular or attribute data collection will be handled best by performing research and compiling data. This will include data entry for information attributes to be used within the system. Possible sources of information collection could include local and regional MLS records, zoning records, tax records, and other publicly available data concerning buildings and sites within the region.

The VBMP digital orthophotography will be one of the best sources for the spatial base map layer. This will be available through arrangements with the Virginia Geographic Information Network. Other possible base map layers may include raster spatial data from the VEDP and USGS.

4. Data Conflation Options (integrated with VBMP digital orthos):

Conflation is the method whereby a geographic feature is adjusted to fit a more accurate base map. This process can occur in variety of ways, with the least sophisticated being a "best-fit" methodology. The best-fit method is a visual inspection or comparison of a geographic feature's current position to where it is or should be located on the more accurate base map.

Another conflation option includes rubber sheeting, a method using control points or existing boundaries to establish the new geographic position of a feature.
Finally, the most accurate method of conflating data includes the use of Global Positioning Satellite technology (GPS), or traditional survey instruments to accurately locate an objects physical location.

5. GUI / Programming Options:

A GUI or graphical user interface is a graphical method of controlling how a user interacts with a computer to perform various tasks. Instead of issuing commands at a prompt, the user performs desired tasks by using a mouse to choose from `a dashboard' of

options presented on the display screen. These are in the form of pictorial buttons (icons) and lists. Some GUI tools are dynamic and the user must manipulate a graphical object on the screen to invoke a function; for example, moving a slider bar to set a parameter value (e.g., setting the scale of a map). (Definition from ESRI)

There are two main avenues to develop an application and GUI for your GIS data. An application can be stand alone or distributed.

Stand-alone applications are typically built by programming modules, scripts and add-ins to perform specific analyses that are extensions of desktop GIS software packages such as ArcView, ArcInfo or AutoCAD.

Another desktop method would be to program a GUI and application from scratch utilizing a programming language and suite such as MS Visual Basic, FoxPro or C++ and a third party GIS programming suite such as ESRI Map Objects. Workstation based or stand-alone applications are usually developed to perform specific higher-end functions for a user that has a working knowledge of GIS systems.

Typically a distributed application will be shared across an intranet or the Internet with the user utilizing a thin client such as a browser. An Internet based application will typically utilize a mix of languages to create a finished product. These languages can include HTML, Java, JavaScript, XML, AXL, Pearl, PHP, JSP, Cold Fusion or MS ASP. Specific knowledge a map server software package such as ESRI's ArcIMS or AutoCad's MapGuide will be required.

6. Internet Functionality and Options

Internet delivery and functionality would provide the public with access to the reservation schedules of park facilities and give park administration access to maintenance schedules. Also, park administration could use the application to develop maps for proposed new facilities that could be printed and distributed at meetings. Internet functionality should include basic GIS functions available in a thin client GIS application, such as ESRI's ArcExplorer (i.e. Zoom In, Zoom Out, Pan, Identify, Query, … etc.).

Additional functionality may include appropriate hyperlinks to critical and related information on the Internet related to certain queries or operations within the application. A dedicated "needs based" approach to determine user interface options and functionality is highly recommended before actual application work is to begin. There are many Internet based map server technologies available on the market today and great care should be taken to evaluate the different options when selecting the software and programming language option that will be utilized for your application.

7. Technical Requirements

Technical requirements will vary greatly depending on whether the application programming, development and hosting functions are in-house or if the functions are outsourced to a GIS applications development and hosting firm. Obviously, the situation that would require the least amount of technical requirements and resources would be to outsource to a firm that already has all the technical requirements and experience in place. However, for the purposes of this paper, we will assume that all of the development and hosting will occur in-house. Some of the resources listed below may already be within the existing pool of resources at some organizations.

- Minimum: A Basic working knowledge of a leading GIS software, and Internet Browser are required. A Pentium III or greater CPU, with a minimum of 128MB Ram, 16MB Video Card, is required. A higher speed Internet connection is recommended for GIS Internet application deployment and analysis. Most leading GIS software is customizable using MS Visual Basic or other common language. It is suggested that the developer have a working knowledge of Visual Basic before attempting GUI development.

- Optimum: In the case where a local government employs a capable information Technology Department, other languages may be considered, such as JSP, Java, Visual Basic, ASP, and Cold Fusion. In most cases, these languages are related to Internet application development. A web developer with three years of experience should be able to customize and/or develop a unique Internet Map Server application.

8. Administrative / Management Requirements

Management concerns will involve technical support, system maintenance and, of course, human resource management issues of a technical product. These issues are minimized if the maintenance and/or hosting of the application are contracted to a GIS application development and hosting organization. Technical and administrative issues become more critical and consuming when developing and/or hosting an application in-house. General expertise in GIS is suggested if outsourcing application development and hosting. In-house application development and hosting will require GIS specialist human resources, advanced web programming human resources, and significant technical material resources (hardware/software).

9. Cost – Cost/Benefit

The cost of developing a park asset inventory application (in house) is between $4,500 and $20,500 depending on the complexity and volume of park assets needed to be managed. The hardware and software requirements make up a majority of the cost for a small park system and the remainder consists of data acquisition costs. Since much of the data is available at low cost or free, data acquisition and development of a small park system does not have as great of an impact. Larger park systems may spend more time

and money developing their data since there are more assets to manage over a larger land area and therefore more spatial data to develop.

This cost/benefit is highly favorable. Time and resources may be saved in daily operations in park administrative offices. For example, if the part of the application is available to the public, reservation schedules for picnic shelters and other facilities could be viewed by clicking on facility point. The administrative personnel normally responsible for handling information requests such as this would not be burdened with these requests thus creating more efficiency in the asset inventory.

10. Standards / Guidelines Summary

All GIS or Spatial data should be delivered, collected or developed in a format and projection that matches the VBMP ortho base map. The attribute, or tabular data, provided by 3rd party entities should be in a standard database format, spreadsheet format or ASCII delimited text file format.

When possible, approach the application development process in phases. This type of application will be very data centric or rely on data a great deal for usefulness to the intended user. Develop a basic database application as a first step and then add the mapping functionality in a separate phase and then add administrative and "back-end" functions in a later phase. This process will help keep the project manageable and allow for dispersed budgeting.

11. Startup Procedures/Steps

- Application Outline / Blueprint: Application purpose, interface design, functionality, queries and "look and feel" should be determined and documented as an initial step. Stakeholders should be involved in this step.
- Data Acquisition: The attribute data should be obtained from the various sources mentioned earlier and normalized and related where necessary. Spatial data can be downloaded from a variety of sources such as the USGS and the US Census Bureau. If spatial data is not available then it will need to be collected and developed.
- Sourcing Determination: Determine entity/entities that will be performing data development functions, application development functions and application hosting functions and create a project plan with budget numbers.
- Develop an implementation plan that includes timelines and milestones.
- Develop a data development/transformation plan that includes metadata definitions, database schema, and data dictionaries with relational information.
- Readdress your project plan, timelines and budgets as a final initial process before committing resources.

- It is recommended that the database application functions be addressed and implemented before the mapping functions.

12. Estimated Time Line and/or Implementation (stand alone) schedule

The estimated time to develop this application varies based on functionality. This can be as little one month, to as much as 8 months. Typically this type of application can be developed in approximately 3 months. Data collection and development functions will add to the time line.

13. Best Practice Example in Virginia:
None